# EXERCISING DEVICE

## CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority of German Utility Model No. 20211491.0, filed on July 12, 2002.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to an exercising device which includes at least one actuating grip adapted to be actuated by a user for exercise, and a counteracting force generating member configured to act upon the actuating grip with a counteracting force. Particularly, the actuating grip and the counteracting force generating member are connected relative to each other through a tensing member and a power ratio varying member.

### 2. Description of the Related Art

Exercising devices are now being set up in housing areas in addition to professional fitness centers. Such kinds of exercising devices are particularly used to build and to strengthen different groups of body muscles. Usually, there is a suitable actuating grip in an exercising device, e.g., a pull rod of an exercising device, to which the user applies his/her operating force to work out the muscles of his/her back by attempting to move them against a resisting force. Overcoming of the resisting force gives rise to an actual effect of physical training. The resisting force is attributed to a counteracting force generating member. Conventionally, the counteracting force generating member is exemplified through weights, since, by means of the weights, a counteracting force can be brought

about independently of the change in speed and position. In order to accommodate the needs of different users and the training of different groups of muscles, a comparatively large number of weights is required so as to have a sufficiently wide range of adjustments for the resisting forces. In case of the exercising device for household use, this gives rise to a grave disadvantage, because a multiplicity of weights is barely practical not only on the aspect of the expenditure for procurement, but also on the aspect of the costs for transport and storage.

**SUMMARY OF THE INVENTION**

It is an object of this invention to provide an exercising device as mentioned above, which renders possible a wider range of adjustment for resisting forces.

In accordance with this invention, the exercising device includes at least one movable actuating grip adapted to be actuated by a user for exercise, and a counteracting force generating member configured to act upon the actuating grip with a counteracting force. The actuating grip and the counteracting force generating member are connected relative to each other through a tensing member and a power ratio varying member. The power ratio varying member is a drive wheel unit which includes at least two disc-shaped wheels that have different diameters, that are coaxially coupled to each other, and that are non-rotatable relative to each other. A coupling unit is further disposed to permit the tensing member to engage a selected one of the disc-shaped wheels.

Some technical terms as used herein are briefly explained as follows:

The term, "drive wheel unit" is directed to a device in which a first rotation movement at an input side thereof is converted into a second rotation movement at an output side thereof. The proportional ratio of rotation movements at the input and output sides determines the conversion ratio of the drive wheel unit.

The term, "counteracting force generating member" is directed to a member which impresses on movement of another element, such as an actuating grip, a force which counteracts the movement of the element. This force can be constant or dependent on the distance covered by, or speed of, the movement of the actuating grip. The counteracting force, albeit unnecessary, can assume a value of zero, when the actuating grip is not moved. In the event of not assuming the value of zero, the counteracting force will press the actuating grip against a striking force which is provided therefor.

The term, " tensing member" means elements which are suitable for transmission of mechanical pulling forces. They can be ropes, for example, belts, chains or the like.

The term, "coupling unit" is directed to a unit which includes two components detachably connected to each other. In a locked position, the components are frictionally connected to each other, or form-locked to each other.

In this invention, the tensing member runs over the drive wheel unit for force transmission. The drive wheel unit includes at least two disc-shaped wheels that are coaxially

coupled to each other, and that are non-rotatable relative to each other. Since the disc-shaped wheels have different diameters, the proportional ratio of the diameters thus determines the conversion ratio of the drive wheel unit. A coupling unit is provided to couple the tensing member to the disc-shaped wheels of the drive wheel unit. The tensing member can be coupled to a selected one of the disc-shaped wheels through the coupling unit. Due to the provision of the coupling unit, the tensing member can be desirably coupled to the selected one of the disc-shaped wheels to thereby obtain different conversion ratios. For example, in the event that the tensing member coming from the actuating grip is coupled to the disc-shaped wheel of a smaller diameter, and that the tensing member running towards the counteracting force generating member is coupled to the disc-shaped wheel of a larger diameter, a force-diminishing ratio is obtained based on the actuating force, the strength of which is determined by the proportional ratio of the two diameters. Accordingly, when the coupling is made the other way around, a force-increasing ratio is obtained. Note that, with two disc-shaped wheels, two different proportional ratios can be obtained. Thus, when a larger number of disc-shaped wheels is provided, a larger number of proportional ratios can be achieved. For example, in case of three disc-shaped wheels with different diameters, there are six different proportional ratios available. In this manner, even in the event that a counteracting force generating member by itself, offers merely a few possibilities of adjustment, a

fine gradation of counteracting forces which act respectively on the actuating grip, will be available. Such a manner is particularly advantageous in a counteracting force generating member which consists of weights, and which requires only smaller and not so heavy weights. It is however, intended in the present invention to encompass a greater range of forces so as to reach the extreme end of great force on the one hand, while on the other hand, to render a fine gradation of the lower region of smaller forces possible.

Preferably, the coupling unit is configured to be quick-releasable. Such a configuration is advantageous when the exchange of the disc-shaped wheels which are respectively coupled to the tensing members through the coupling units, is to be carried out in a simple and rushed manner. With this configuration, the proportional ratio can be easily and conveniently adapted to meet the respective demand.

Preferably, the coupling unit is configured to be form-locking. Such a configuration permits a particularly simple and secure fastening of the tensing member to the respective disc-shaped wheel. The form-locking configuration renders possible a particularly quick and secure coupling of the tensing member to the disc-shaped wheel.

Accordingly, the coupling unit is configured such that, a plug is disposed on one end of the tensing member, and a undercut cavity, which is formed in the circumferential area of the disc-shaped wheel, is accessible externally through a transverse channel. The transverse channel is a channel which

is disposed transverse to the pulling direction of the tensing member, i.e., preferably extending in the axial direction. Such a configuration renders possible simple disengagement of the tensing member from the disc-shaped wheel of the drive wheel unit. The tensing member is pushed into the undercut cavity of the disc-shaped wheel laterally through the transverse channel by means of the plug disposed at the end thereof. Due to the provision of the undercut cavity, the plug can only be removed from the cavity through the transverse channel. In other words, it can not be pulled out of the cavity with the radial pulling forces in the tensing member. As a result of the provision of the coupling unit, aside from ensuring secure coupling of the tensing member to the disc-shaped wheel, a greater force of pulling is also achieved. While the plug is preferably configured to be cylindrical, it can also assume other forms, e.g. ball-shaped. A cylindrical shape is advantageous in that the stress of the material due to surface pressing is comparatively small.

Preferably, the cavity includes an entry region which is communicated with the transverse channel, and a securing region which is communicated with the entry region in a circumferential direction, and which is configured to accommodate the plug. Such a configuration renders possible sidewise insertion of the plug of the coupling unit into the entry region of the cavity and subsequent shifting into the close-ended securing region through the transverse channel. Due to this configuration, the plug which is subject to load, is moved out from the entry region

and into the securing region so as to be guarded against slipping out of the cavity. With such provision, the coupling unit could also be guarded against unintentional loosening when subjected to sidewise pulling forces. Loosening of the coupling unit is only possible in an unloaded state. At that moment, the plug is moved out from the securing region into the entry region where the plug can be finally removed therefrom through the transverse channel.

Preferably, the disc-shaped wheels are configured to be alignable in sequence. With such a configuration, the number of the available proportional ratios can be increased with the inclusion of additional disc-shaped wheels so that the applicable range of the drive wheel unit can be broadened. As a result, the drive wheel unit can accommodate such an exercise that requires in the lower region of smaller forces quite a number of particularly fine gradations.

Preferably, the drive wheel unit includes three disc-shaped wheels. With such provision, there could be up to six different proportional ratios while obtaining a compact structure of the drive wheel unit.

Preferably, the disc-shaped wheels, especially the outer wheels, are configured to be exchangeable with one another. The exchangeability of the wheels renders possible a feasible application of a single disc-shaped wheel of the drive wheel unit, thereby sparing the coets of production and storage. Preferably, the disc-shaped wheels are configured to be noncircular, especially ellipsoid. With such provision, the

ratio given rise to by the drive wheel unit can vary according to the angular position of the disc-shaped wheel. As a result, the strength of the counteracting force acting upon the actuating grip is dependent upon the wheel position. This configuration has an advantage in that the stroke of the resultant counteracting force can be regulated by taking into consideration a biophysiological factor, particularly, an anatomical factor. For example, when body joints are not sufficiently stretched in the initial period of the exercising movement, a comparatively small force is applied thereto so as to treat the joints more gently, whereas in the progressing period of movement of the actuating grip, more counteracting forces can be exerted on the comparatively unloaded joints. Understandably, the diameter of the wheel is preferably selected such that the ellipsoid wheel is only rotated over the actuating route of the actuating grip.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment of the invention, with reference to the accompanying drawings, in which:

Fig. 1 is a partly exploded perspective view of an exercising device according to a preferred embodiment of this invention;

Fig. 2 is a perspective view to illustrate a tensing member of a drive wheel unit of the preferred embodiment;

Fig. 3 is an exploded perspective view of a drive wheel unit of the preferred embodiment; and

Fig. 4 is an enlarged and detailed view of a disc-shaped wheel which is provided with a coupling unit according to this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures 1 to 4, the preferred embodiment of an exercising device according to this invention is shown to comprise a frame 1 and an actuating grip 2 and a counteracting force generating device 3 which are coupled to each other through a tensing member 5. The tensing member 5 is trained on a drive wheel unit 4.

The frame 1 of the exercising device includes a base 12 disposed on the lower end thereof, and an overhanging beam 13 disposed on the upper end thereof. The frame 1 divides the exercising device into an imaginary side for the user, and an imaginary side for the technical components, specifically, the counteracting force generating member 3 and the drive wheel unit 4. At the user side, a bench 14 is disposed on the base 12 for the user. The bench 14 is disposed such that a user who is seated thereon adjusts himself in a position suitable for grasping the actuating grip 2 to perform the respective exercise. At the technical component side, the counteracting force generating member 3 is disposed on the base 12. Over the counteracting force generating member 3, is disposed the drive wheel unit 4 which is hung on the overhanging beam 13 at the technical component side.

The actuating grip 2 includes many parts. Preferably, it includes a hand portion and a foot portion, for example, a foot

hold for leg stretching exercise.

The hand portion illustrated in Fig. 1 includes a swinging handle 20 and pull rods 23, 24. The swinging handle 20 is movably mounted to the overhanging beam 13 through a swinging hinge 21, and is provided with grips 22. The grips 22 as illustrated, are solely for demonstration. The swinging handle 20 may be attached to other elements for actuation by the user. One end of the tensing member 5 is disposed on an end of the swinging handle 20 which is distal from the grips 22. The other end of the tensing member 5 is secured to the counteracting force generating member 3. The counteracting force generating member 3 is exemplified as a stack of weights 31, which are disposed on a guiding member 32 and which are movable vertically.

The tensing member 5 is divided into two segments 51, 52 by the drive wheel unit 4. The segment 51 is at the user side and the segment 52 is at the technical component side.

The exact dispositions of the segments 51 and 52 of the tensing member 5 on the drive wheel unit 4 as well as their arrangements are illustrated in detail in Fig. 2 and in Fig. 3. At first, the structure of drive wheel unit 4 is described. The drive wheel unit 4 is exemplified to consist of three disc-shaped wheels 41,42,43. They are disposed on a common shaft 44, which extends into the middle one of the wheels 41,42,43 through a corresponding opening. The disc-shaped wheels 41,42,43 are coupled to, and are non-rotatable relative to each other by virtue of, in total, three screw bolts 45 which are respectively led to pass through three corresponding through

bores in the disc-shaped wheels 41,42,43. The segments 51, 52 of the tensing member 5 are respectively coupled to the disc-shaped wheels 41,42 through the coupling unit 6. In this connection, the segment 51 which comes from the actuating grip 2 is coupled to the disc-shaped wheel 41 which is of a smaller diameter (d). The segment 52 led towards the counteracting force generating member 3 is coupled to the disc-shaped wheel 42 which is of a diameter (D) that is larger than the diameter (d). The proportional ratio of the diameters D : d determines the magnitude of the power ratio of the drive wheel unit 4. For example, it runs up to 2:1, 1:1 or 1:2 depending on which one of the segments 51, 52 the disc-shaped wheels 41,42,43 are coupled to.

The structure of the coupling unit 6 which is illustrated in detail in Fig. 4, is demonstrated as an exemplary embodiment of the coupling unit 6 to be provided between the disc-shaped wheel 41 and the segment 51. The segment 51 includes a cylindrical plug 61 at one end. The cylindrical plug 61 portrays the portion of the coupling unit 6 at the side of the tensing member 5. The portion of the coupling unit 6 at the side of the disc-shaped wheel 41 takes the form of a receiving cavity 62 which is formed as an undercut opening in the circumferential area. The receiving cavity has an entry region 64, and a securing region 65 which is adjacent to the entry region 64 in a circumferential direction. In both regions 64,65, the receiving cavity 62 is of a dimension such that the plug 61 at the end of the segment 51 can be received therein. The securing region

65 is sidewise, i.e. closed in the axial direction. The securing region 65 is disposed to be communicated with the circumferential region merely through a slit of such a dimension as to permit the passage of the tensing member 5, but as not to admit thereinto the plug 61. The entry region 64, on the contrary, is laterally open. In other words, it is accessible to the outside through a transverse channel 63. The plug 61 at the end of the segment 51 can be led through the transverse channel 63 in the axial direction from the outside into the entry region 64 of the receiving cavity 62. Through the tensile stress in the tangential direction, the plug 61 is then moved from the entry region 64 into the securing region 65 where the plug 61 is guarded against slip-off in sidewise directions because the securing region 65 is closed laterally. As a consequence, the coupling unit 6 is automatically secured, as soon as the draw on the segment 51 of the tensing member 5 is carried out. Therefore, a simultaneous quick and secure coupling of the tensing member 5 to the drive wheel unit 4 is accomplished. Likewise, it is also applicable to the segment 52 of the tensing member 5. In this connection, the entry region 64 and the securing region 65 of the receiving cavity 62 which are at the opposite pulling direction of the segment 52, are correspondingly exchanged in the circumferential direction.

The disc-shaped wheels 41,42,43 can be made of metal or a synthetic material which is able to provide adequate resistance. Preferably, the disc-shaped wheels 41,42,43 are of dimensions such that they can withstand at least a quadruple overload when

subjected to a static load by virtue of the counteracting force generating member 3.

The drive wheel unit 4 can be expanded in a simple manner, in which additional disc-shaped wheels may be further incorporated. The construction according to this invention renders possible the arrangement of as many disc-shaped wheels as desired in sequence. As such, a desirable great multitude of proportional ratios is readily available.

While the present invention has been described in connection with what is considered the most practical and preferred embodiment, it is understood that this invention is not limited to the disclosed embodiment but is intended to cover various arrangements included within the spirit and scope of the broadest interpretations and equivalent arrangements.